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AUTHOR Barone, Richard; Parod, William, Jr.
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ABSTRACT

This paper reports on the evolution of a software environment called ClassACT (Class Annotation and Collaboration Tool) from a simple multimedia annotation program to a multi-domain archival database management system. ClassACT was developed at Northwestern University (Illinois) for instructional use, and, although its original goal was to solve a specific problem for a single instructor, it has grown in breadth of functionality and gathered a following of users and supporters from varied disciplines. An overview is provided of ClassACT's utility in the context of its evolution over 4 years, and its future is contemplated. Topics discussed include: history of ClassACT, including the development of an image database for a multi-disciplinary course in English and American History, and conversion to a World Wide Web-based system; features of ClassACT, which include a hypermedia document management system, searchable media database, and groupware tailored for class-based projects; application of ClassACT to provide annotation, collaboration, and archiving tools that allow an instructor to create an interactive learning environment; the basic notebook display, as well as student and instructor viewpoints; librarian and administrator functions; searching; instructor, student, and developer/support benefits; and challenges for the future, including two diverging application models--the shared archive and cognitive process models. Five figures illustrate ClassACT displays. (AEF)

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ClassACT: The Evolution of a Collaborative Learning Tool

Richard Barone
Learning Technologies Group, Academic Technologies
Northwestern University
email: ibrich@nwu.edu

William Parod, Jr
Emerging Technologies Group, Academic Technologies
Northwestern University
email: bill-parod@nwu.edu

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TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)

Abstract: This is a reporting on the evolution of a software environment called ClassACT, Class Annotation and Collaboration Tool, from a simple multimedia annotation program to a multi-domain archival database management system. ClassACT was developed at Northwestern University for instructional use and although its original goal was to solve a specific problem for a single instructor it has growth in breath of functionality (as is the norm for today's software applications) and gathered a following of users and supporters from varied disciplines. This paper will give an overview of the utility of this tool in the context of its evolution over four years in Northwestern classrooms. It will in turn contemplate ClassACT's future. A future that is at the same time promising from a pedagogical standpoint and perplexing to its developers.

Background

The teacher is one who makes two ideas grow where only one grew before.

--Elbert Hubbard

Since we a talking about evolution it is important to know something about ClassACT's history. Perhaps the most interesting comparison of then and now comes with a look at the motivation for the initial project. The project started late in 1992 as series of discussions between the Learning Technology Group and Professor Carl Smith of the Department of English and The Program for American Culture. Professor Smith's initial need was to do something he had not been able to accomplish to his satisfaction in his 20 years of teaching at Northwestern: provide students with adequate access to his slide collection. Smith was also interested in incorporating materials from the American Memory Project (then distributed only on laserdisc). A proposal to start work on the project was sent to the director of the Academic Computing and Network Technologies in early 1993.

Excerpts from the Original Proposal (February 2, 1993)

Professor Smith's goals, specific but potentially far reaching:

Carl Smith's basic goal is "to explore the possibilities of multi-media resources in humanities education". He wishes to learn how these resources can be used to supplement print materials and what it would take for faculty and students to use them in both individual and group situations.

...

The American Memory Project is a superb example of how technology has improved access to primary source materials and yet its utility on campus remains essentially unexplored. Carl envisions three ways that it can be adapted to help train students in the analysis of primary sources:

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1) by encouraging "students to use the American Memory Project directly";
2) by using "the American Memory Project and other digitized teaching materials to develop new and superior kinds of classroom presentations and assignments";
3) by providing "a framework in which students can use these new resources to put together their own papers and presentations".

This next point proved to be a precursor of what would drive future forms of the project:

To accomplish this he wishes to collaborate with ITG to make appropriate portions of the AMP collection easily accessible in an "intellectually challenging and engaging form" and to build templates that would give students a new format for organizing, presenting, and analyzing these materials.

The implications of Professor Smith's proposal reach far beyond the potential benefits to his classes. Firstly, and I cannot understate this, that new technology requires new methods for it to reach its potential, and it is time for that potential to be realized. Committing to curriculum development and to a complete integration plan for existing courses, this effort aims to take full advantage of the resources and tools it embraces.

A hypothetical statement that proved accurate 3 years later:

Efforts such as this "will provide a broader evaluation of the assets and liabilities of multimedia in humanities education. There is no way to conduct such an evaluation without undertaking a project of this kind."

First Offering

In the fall semester of 1993 "The Cultural Imagination of Turn-of-the Century America", a multi-disciplinary course in English and American History, reached the classroom. The instructor's main goal at that time was to take advantage of electronic resources, especially digital image collections, to increase student access to source materials. "Cultural Imagination" established a learning environment that interconnected the literature, images (paintings, illustrations, movies), and sounds of the early twentieth century. Students not only accessed sources electronically but were also encouraged to complete their assignments, when appropriate, in electronic form. From 1993 through 1995 access to the imagebase (image database) was provided by HyperCard stacks served over Appleshare. This was a satisfactory network solution for a course with 20 students served by well equipped Macintosh labs, but soon other issues needed to be addressed. Access for Windows users, so that any student using the imagebase could access it from NU's newly wired dormitories, was imperative. Copyright agreements had to be protected. If the imagebase was to become a more generic tool and if more faculty were to find it useful, it had to provide access to external archives. It also needed to scale up from hundreds to thousands of images while preserving its flexibility and ease of use. All of these issues were addressed with the conversion of the "Cultural Imagination" imagebase to a web-based system in early 1996. This was made possible in great part by the rapid advances in WWW software tools and an institutional license with Oracle Corporation.

The Emergence of ClassACT

Professor Smith's imagebase was migrated to the world wide web for the Spring quarter of 1996. The migration required a significant file conversion undertaking that was accomplished with a commercial batch image processing utility, but the core of the effort was embodied in three major tasks:

1. An update of Smith's annotated notebooks, a major component in the course structure.
2. The development of a web-based interface for the course.

3. The development of a cgi, common gateway interface, between our server and the Oracle database that now controlled access to all media elements.

The first two tasks were mostly the responsibility of Professor Smith, which he accomplished with the appropriate technical support. The third task was accomplished by our technical staff in close consultation with Smith in order to satisfy his course model. It is this third task that we will focus on now for the server-cgi-database composite that resulted is the nexus of ClassACT.

So What is ClassACT?

ClassACT is a hypermedia document management system, a searchable media database, a groupware software application tailored for class based projects.

How does ClassACT apply to the Classroom?

ClassACT provides annotation, collaboration and archiving tools that allow an instructor to create an interactive learning environment. The ClassACT information web page offers:

ClassACT allows an instructor to assemble an on-line collection of multimedia, called a "notebook", for use in a course, and to provide commentary (or annotations) with each of the media in the notebook. ...Students enrolled in a course using ClassACT have access to the instructor's on-line notebook, and they may create their own versions of the Notebook during the quarter. Students have the choice to keep their own notebooks private (e.g., for self- study) or they may elect to publish their notebooks for the purpose of collaboration or for submission as a formal class assignment.

The Basic Notebook Display

ClassACT notebooks are displayed as hypermedia web pages. The default display model, the one used in Carl Smith's prototype, is that of an annotated image: a page with a thumbnail image and a block of text, the annotation. The thumbnail image links the notebook to more information about the annotation. In Smith's prototype model this was usually a high resolution version of the thumbnail image. But the link can also point to a quicktime movie file, an audio file, a text document or a local or remote URL.

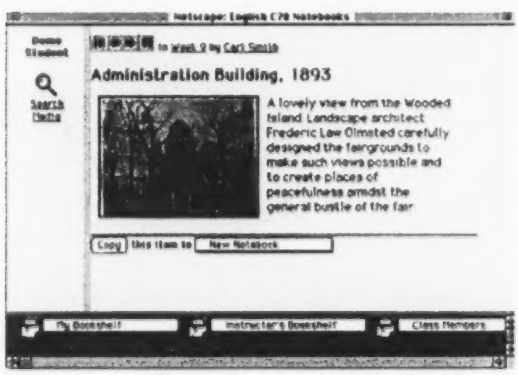
Administration Building, 1893
A lovely view from the Wooded Island. Landscape architect Frederic Law Olmsted carefully designed the fairgrounds to make such views possible and to create places of peacefulness amidst the general bustle of the fair
Copy this item to
New Notebook
My Bookshelf
Instructor's Bookshelf
Class Members

Figure 1: A notebook page with thumbnail image and annotation area.

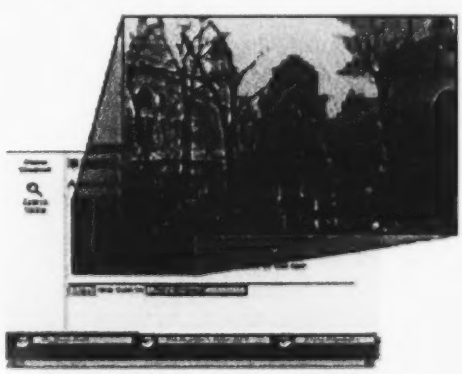

Figure 2: Smith's Prototype linking thumbnail image to Hi-Res version.

A frames-capable browser is required to view the notebooks. The notebook pages consists of two frames, one for the notebook body and a navigation frame at the bottom which is always available, providing access to all of the reader's notebooks, the instructors notebooks and notebooks made viewable by other class members. The navigation frame also provides access to profiles for each member of the class.

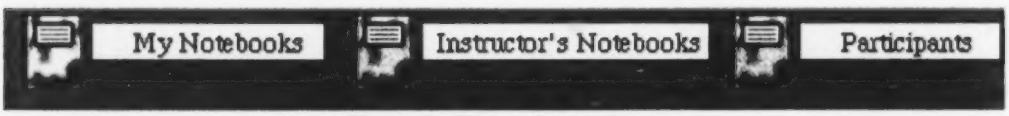

Figure 3: The navigation frame

The notebook body, in addition to the thumbnail image and annotation block, contains a set of icons in the left margin. Each icon represents a tool that adds functionality to the to current page. This format is consistent for all notebook views although the specific tools available in the margin depends on the access level granted to the viewer.

The Student Viewpoint

Students create their on-line notebooks using ClassACT's HTML FORMS interface. This is done completely within the structure of ClassACT. They do not need an off-line editor; absolutely no knowledge of HTML is required. A student has the ability to create and delete notebooks and determine who in the class can view them. They can search the media catalog, copy information from the instructor's notebooks, trade information between their own notebooks, add links from external web sites and insert their own original text.

The Instructor Viewpoint

The instructor can do what a student can with the added ability to "publish" a notebook. All published instructor notebooks are available to class members from the "Instructor's Bookshelf", which is available in the navigation frame at the bottom of all notebook display pages.

The Librarian

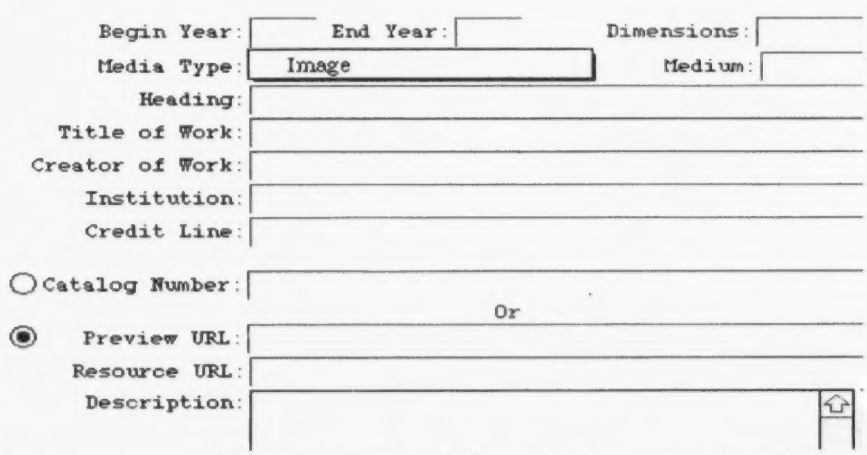

Figure 4: Librarian privileges grant access to catalog information.

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Instructors like Professor Smith who wish to provide access to special image collections need to first digitize the collection and then enter each item of the collection into a ClassACT catalog. In order to do this the instructor must have "librarian privileges" in addition to normal instructor status. Entries to the catalog need not be limited to local collections of media however. Anything one locates on the web, i.e. anything with a valid URL, may be incorporated into a catalog. In this respect the catalog can be used as a sophisticated bookmark manager.

The Administrators (User, Domain and Group)

The prototype for ClassACT dealt with user administration: a system for adding and deleting members from the class. As ClassACT became available for multiple classes there needed to be a way to separate the various functions of ClassACT for concurrently active classes. The solution for this was to implement the concept of domains. Each class can now be assigned its own domain with independent catalog, class roster and notebook collections. The domain administration privilege is required to create and manage a domain. A group administration feature was also added after the prototype. A group administrator can define workgroups of two or more students within a domain (class). Students in the same workgroup have the option of exclusively sharing a notebook within the group.

Searching

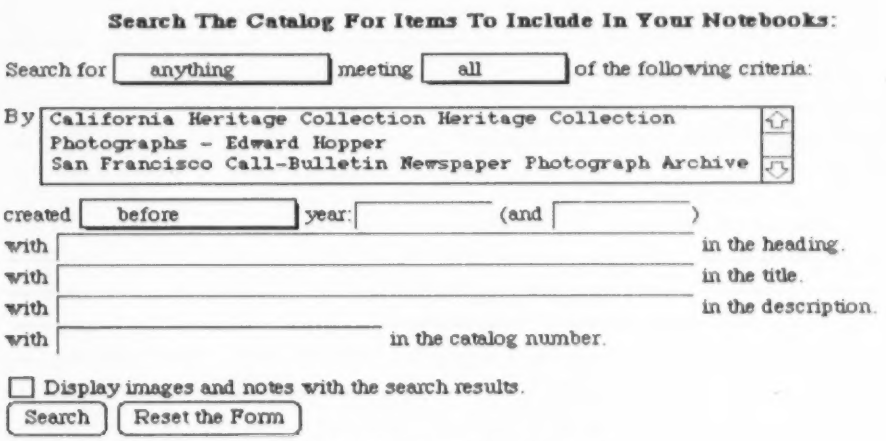
Search The Catalog For Items To Include In Your Notebooks:
Search for anything meeting all of the following criteria:
By California Heritage Collection Heritage Collection
Photographs - Edward Hopper
San Francisco Call-Bulletin Newspaper Photograph Archive
created before year: (and)
with in the heading.
with in the title.
with in the description.
with in the catalog number.
Display images and notes with the search results.
Search
Reset the Form

Figure 5: ClassACT search options.

Since an Oracle database administers the notebooks and the media catalog, its extensive search capabilities are at ClassACT's disposal. Searching is nonetheless limited to the information recorded for catalog items. Since simple searches were adequate for the prototype course, catalog detail was a low priority. However, recent development of the product, looking to expand the utility of ClassACT, has concentrated on defining a catalog record that is consistent with current archival digital media projects. Down the road it may be possible to create and maintain an extensive legitimate shared archive of digital media with the ClassACT interface.

The Big Picture

A Summary of Results and Benefits

The man who can make hard things easy is the educator.

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--Ralph Waldo Emerson

The recurring theme of the development team from the original HyperCard version of Professor Smith's class to the media notebook model of ClassACT was that "it has to be easy for the students to use". Smith above all else insisted on this. With this understood the general objectives and priorities were defined and remained essentially the same throughout the entire evolution of the project:

1. To provide students with extended access to source materials of various forms.
2. To improve student-teacher and student-student communications.
3. To stray from traditional course structures by providing tools that would allow students to electronically publish course assignments and journals.

Instructor and Students Benefits

It is safe to say that at least for the Smith class model, which will be taught for the fourth time in the fall '97 quarter, all of these objectives were met. According to Smith the instructor-student benefits were significant. The increased opportunity to analyze source images resulted in a broader participation in class discussions. The electronic paper was made available as an optional form of expression in his course. There was no contention, nor was there any expectation, that an electronically delivered paper would be superior to a printed one. Electronic notebooks offered their authors the ability to link directly to a source image in contrast to making a written reference. Most of the students throughout the history of the Smith model chose to submit at least one assignment as an electronic notebook. Those students who chose to produce class projects as electronic documents rather than traditional printed papers, according to Smith, "did as well".

Developer/Support Benefits

Converting the original "mediabase" project into a web tool has provided cross-platform access and expanded the scope of the tool by adding the ability to link to other appropriate web sites. The implementation of a full function database made the application scalable. Improved searching capabilities and the "potential" to cope with large classes has made ClassACT attractive to a larger segment of the faculty at Northwestern. The Oracle database component also adds security for access to a ClassACT domain now requires an account name and password. This is an important feature when the issues of copyright and fair use are discussed with faculty.

The Challenge: Where are we going with this?

Just how will ClassACT scale up? Can we handle a large class of 200 students that could generate many simultaneous hits to the site? Are our accounting and document management components robust enough to handle more than two or three separate classes? Certainly the Oracle database has been used in far more demanding situations but will we have to continually modify and update the cgi scripts that form the underpinnings of ClassACT? Should we convert the interface from Pearl to JAVA or C++ to speed up what may be a bottleneck as we accept larger numbers of users? Should we continue development in-house or should we look to commercial software tools to handle some of the tasks, such as document management? Should we just freeze development here and apply what we have learned when we go shopping for commercial software? Should we seek a collaborative effort with other universities, pooling resources, to continue and refine the product?

If ClassACT doesn't capture the imagination of faculty and provide instructional solutions for a significant number of them then these questions will never have to be acted upon. This is however not the case. ClassACT has been meet with enthusiastic responses whenever we have demonstrated it. It is currently being used in one Art History class at

Northwestern and under consideration for two others, one a large lecture hall class that would allow us to test one of the above concerns. Instructors at other universities have also expressed interest in using the tool.

But the most challenging new application for ClassACT will come in the fall when it is used in a Political Science course that deals with the effects of media on government policy. Student's in the class will be required to collect and display media for assignments. This means that students will require "Librarian privileges" so that they can add their digitized media files to the domain catalog for the class. In all previous application of ClassACT only the instructor and teaching assistants were allowed to modify the catalog for a class. This will be some work for us but it is the kind of innovative use of technology that we seek to support.

Still the biggest challenge lies with the instructor who is determined that all class assignments will be created within the framework of ClassACT notebooks. This "no print option" is a most significant commitment to the technology. In previous offerings of this class the instructor has had difficulty gathering the various elements of her students multimedia projects. She found it equally difficult to get feedback to them. She sees ClassACT as an appropriate organizational tool and a great time saver for her and her students. Where Professor Smith sought to offer an additional form of expression with his notebook model, this instructor intends to completely replace what was for her an inefficient traditional delivery method with a more appropriate one. Maintaining the traditional method for her would be like finding a solution but keeping the problem.

Two Models Surface

These recent adaptations highlight what we have for sometime suspected: ClassACT addresses two diverging application models: the shared archive model and the cognitive process model. The large Art History course which requires access to an extensive collection of media points in the direction of the former. Courses like this rely heavily on the cataloging capabilities of ClassACT. Notebooks are used as paths through a growing maze of media information.

The Political Science media course, with it's heavy emphasis on using media in the learning process is the epitome of the later model. This model demands a high degree of interactivity and special attention to improvements to the computer-human interface in future versions Although some class applications may require components of both models, as in the Smith prototype, there are enough special needs in each to suggest independent development.

Which model will prevail ?

Are we really developing two tools? The "shared archive model" is probably the easiest sell to faculty. Most of the work required of an instructor in this model involves cataloging media and creation of instructor notebooks. Since this should be completed before the first class meeting, virtually no attention to ClassACT is required of the instructor when the class is in session. The early adopters of the "cognitive process model" are entering unexplored territory and the amount of effort they will have to commit to will be harder to gauge. Members of this group of faculty will likely place the greatest stress on ClassACT often requiring new features as they ultimately see new possibilities.

It might be easier to concentrate on one model and try to learn as much as possible from it. Yet from our viewpoint as instructional support staff, both models are welcome. The most important component in any educational undertaking is good content. Once the content is defined by the instructor, choosing the "appropriate" technology becomes the focus of implementation. Our experience has been that both models provide instructors with a means of delivering and enhancing their content although under different circumstances. We have grabbed the tiger by the tail; do we hold on with two hands?